Materials Science

MEASURING THE GLASS TRANSITION TEMPERATURE OF POLYELECTROLYTE MULTI-LAYER THIN FILMS. Jonathan E. Mueller, Peter K. Walhout,* Department of Chemistry, Wheaton College, 501 College Ave., Wheaton, IL 60187, Peter.K.Walhout@wheaton.edu

Polyelectrolyte multi-layered thin films (PMLs) show great technological promise as a means of controlling thin film structure down to the order of several angstroms. This work seeks to measure the glass transition temperature for a series of PML thin films with the hopes of better understanding the viscoelastic behavior of this relatively new class of materials. It is hoped that the glass transition of a film can be tuned during its synthesis by controlling either the pH or salinity of the polyelectrolyte dipping solutions. In addition, these studies will offer new data in the ongoing fundamental effort to understand glass transitions in general. Thin films were synthesized using poly(acrylic acid) and poly(diallyldimethylammonium) chloride (PDDA). Film thickness was characterized by ellipsometry and visible reflectance interferometry. Glass transitions were measured by measuring the thickness of a thin film as the temperature was ramped down at 1 K/min.

Results are presented for several polystyrene thin films that serve as standards to test the ellipsometric methodology. Glass transitions of near 373 K are obtained in accordance with known values. Results are also presented for a plain poly(acrylic acid) (PAA) thin film and preliminary results are given for a PAA/PDDA multilayer thin film. The thin films studied so far exhibit complicated behavior, likely due to the large intake and release of water upon heating and cooling.